

# VIDEO DISPLAY APPARATUS WITH SEPARATE DISPLAY MEANS FOR TEXTUAL INFORMATION

## BACKGROUND OF THE INVENTION

### 1. Field of the Invention

This invention relates to a video display apparatus that has separate display means for textual and other visual information and methods that utilize such separate display means.

### 2. Description of the Related Art

In television programs, there are many circumstances in which textual information needs to be displayed. For example, there is closed caption text that is broadcast for hearing-impaired people. If a viewer enables the closed caption option, the television receiver displays the closed caption text on the monitor. However, the text usually occupies a substantial portion of the picture so that viewers cannot enjoy the full picture.

In many cases, broadcasting stations broadcast foreign programs. If the foreign programs are broadcast in their original languages, a translation is typically provided in the form of text, which is usually displayed at the bottom of the picture. As with the closed caption text, this text blocks a substantial portion of the picture, thereby preventing viewers from watching the full picture.

Currently, many movies are available in the form of videocassettes, CDROM, DVD (Digital Video Data), etc. Quite often, these movies are foreign and distributors usually insert textual translation into the video signals. Consequently, this textual translation occupies a substantial portion of the picture and prevents viewers from watching the full picture. When movies are

1 recorded as videocassettes, the textual translation becomes a part of the video signals.  
2 However, in the case of DVDs, the textual translation is recorded separately from the video  
3 signals and the viewer has the option of turning off the textual translation. However, if the  
4 viewer does not understand the foreign language and the viewer's language is not provided,  
5 then the viewer has no choice but to turn on the textual translation option. In some cases, the  
6 viewer wants to learn a foreign language and watch a movie in the foreign language. With  
7 DVD, it is possible to display the original text in the original language. Even in this case, the  
8 text blocks a substantial portion of the picture and prevents viewers from watching the full  
9 picture.

10 When a foreign movie is shown in a movie theater, textual translation is usually shown on the  
11 screen. Typically, the textual translation is directly written onto the film. As with television  
12 receiver, this translation blocks a substantial portion of the screen and prevents viewers from  
13 watching the full picture.

14 Thus, there is a need for a video display apparatus that can display textual information without  
15 blocking a part of the video.

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**SUMMARY OF THE INVENTION**

2 Thus, it is an object of the present invention to provide separate display means for a video  
3 display apparatus so that textual information can be displayed in the separate display means. As  
4 a result, the viewer can enjoy the full picture.

5 It is another object of the present invention to provide broadcasting methods that utilize such  
6 separate display means, so that textual and auxiliary information can be effectively displayed on  
7 the separate display unit while the full picture is displayed on the video display area.

8 The other objects, features and advantages of the present invention will be apparent from the  
9 following detailed description.

## BRIEF DESCRIPTION OF THE DRAWINGS

Fig. 1 shows an example of a television receiver that has a separate display unit for textual and other visual information.

Fig. 2 shows a television receiver where a separate display unit is built in a retractable manner.

Fig. 3 shows a television receiver where a separate display unit is built in a retractable manner, when the separate display unit is in use.

Fig. 4 shows an example of a wall-mount television receiver that has a separate display unit for textual and other visual information.

Fig. 5 shows an example of a television receiver with a separate display unit located in the upper part of the television receiver.

Fig. 6 shows an example of a television receiver that has two separate display units located in the upper and lower parts of the television receiver.

Fig. 7 shows an example of a television receiver that has a vertical separate display unit located in the right side of the television receiver.

Fig. 8 shows an example of a television receiver that has a vertical separate display unit located in the left side of the television receiver.

Fig. 9 shows an example of a television receiver that has two vertical separate display units located in both sides of the television receiver.

Fig. 10 shows an image that provides information on runners in a baseball game.

- 1 Fig. 11 shows examples of special characters which indicate that strings between the special  
2 characters are auxiliary information.
- 3 Fig. 12 shows an example of a movie theater display apparatus, which has a separate display  
4 means located below the screen.
- 5 Fig. 13 shows an example of a movie theater display apparatus, which has a separate display  
6 means located above the screen.
- 7 Fig. 14 shows an example of a movie theater display apparatus, which has a vertical separate  
8 display means located on the right side.
- 9 Fig. 15 shows an example of a movie theater display apparatus, which has a vertical separate  
10 display means located on the left side.
- 11 Fig. 16 illustrates how text signals are transmitted to the separate display unit in the movie  
12 theater.
- 13 Fig. 17 shows a block-diagram of the synchronization means.
- 14 Fig. 18 shows how special markers can be put into the analog film as a synchronization means.
- 15 Fig. 19 shows another example of special markers that are put into the analog film as a  
16 synchronization means.
- 17 Fig. 20 illustrates how videos and text can be displayed on the screen using a single projector.
- 18 Fig. 21 shows examples of screens that can display both videos and text.

- 1 Fig. 22 illustrates the connection cables between a DVD player and a television receiver.
- 2 Fig. 23 shows another example of the connection cables between a DVD player and a television  
3 receiver.
- 4 Fig. 24 shows an example of a text image in DVD.
- 5 Fig. 25 shows an example of how subtitles in the original language are displayed on the picture  
6 area, while other subtitles in a different language are displayed on the separate display  
7 means.
- 8 Fig. 26 shows an example of how subtitles in the original language are displayed on the upper  
9 separate display means, while other subtitles in a different language are displayed on  
10 the lower separate display means.
- 11 Fig. 27 shows an example of a television receiver that has two separate display units, one of  
12 which displays auxiliary information, including the channel number, the station name,  
13 the title of the program, the remaining time and the current time.
- 14 Fig. 28 shows an example of a wall-mount television receiver whose separate display unit has  
15 been retracted into the television receiver.

## DESCRIPTION OF THE ILLUSTRATED EMBODIMENTS

### Embodiment 1

There are many circumstances in which the television receiver needs to display textual information, such as closed caption text or the textual translation of foreign movies. Sometimes, a viewer wants to learn a foreign language and watch a movie in the foreign language. With DVD, it is possible to display the original text in the original language. However, when such text is displayed, it occupies a substantial portion of the picture and the viewer cannot enjoy the full picture. In order to solve this problem, the present invention provides separate display means for a television receiver so that the textual information can be displayed in the separate display means without occupying the picture area. As a result, the viewer can enjoy the full picture while obtaining information from the text displayed in the separate display means.

In order to display the textual information in the separate display means, the television receiver needs to separate the textual information from the input signals that include video signals, audio signals, text signals, and control signals. If the textual information is inseparably inserted into the video signals as in the case videocassettes, it will be difficult to extract the textual information. However, there are many other cases in which text signals are separately mixed with video signals. For instance, the text signal can be in the form of closed caption text, or it can be stored as separate images, as in the case of DVD. If the text information is in the form of closed caption text, the television receiver can easily separate the text signals from the input signals, and then display them in the separate display means. If the input signals come from a DVD player, then the textual information that is stored as separate images can be easily extracted and displayed in the separate display means. For instance, once the text signals are extracted, they can be sent to the separate display unit as bitmap using a different cable.

Fig. 1 shows an example of a television receiver that has a separate display means for textual information. The television receiver **112** has a video display area **110** for video and a separate display means **111** for textual information. The location of the separate display means may be anywhere outside of the video display area **110**. In the case of television receivers, the separate display means **150** can be placed in the upper part of the television receiver **151** (Fig. 5). As illustrated in Fig. 1, it can also be located in the lower part of the television receiver **112**. Some languages can be written vertically. In such cases, the separate display means **171** can be located vertically in the right side of the television receiver **170** (Fig. 7). Alternatively, the separate display means **181** can be located on the left side of the television receiver **180** (Fig. 8). Since the separate display unit can be used for various applications, it may be useful for the television receiver to have multiple separate display units (Fig. 6 and Fig. 9). The television receiver **161** in Fig. 6 has two horizontal separate display units **160**, **162**. The television receiver **191** in Fig. 9 has two vertical separate display units **190**, **192**.

The separate display unit can be built into the television receiver in a retractable manner. Figs. 2-3 show such an example. When the separate display unit is not in use, it is hidden inside the television receiver **120** (Fig. 2). When a viewer wants to display textual information in the separate display unit, the separate display unit **131** comes out from the television receiver **130** and displays the textual information (Fig. 3). Recently, some television receiver models have been designed to be hung on the wall. The teaching and idea of the present invention can be applied to such a television receiver. Fig. 4 illustrates how the wall-mount television receiver **140** with a separate display unit **141** works. In addition, the separate display unit can be designed in such a way that it is hidden inside the television receiver when it is not being used. For instance, when it is not being used, the separate display unit **141** can be retracted into the television receiver **140**. As a result, the separate display unit will not be seen, as shown in Fig. 28. If it needs to be used, it comes out from the television receiver and displays textual information.



1 Quite often, the textual information which is to be displayed in a frame consists of several  
2 sentences. In order to avoid confusion, the television receiver usually displays these sentences  
3 on separate lines, resulting in several lines of textual information. However, due to a physical  
4 limitation, in most cases the separate display means is high enough to accommodate only 2-3  
5 lines. In order to solve this problem, the present invention also provides the means to display  
6 the textual information using different colors. For example, the sentence of one speaker is  
7 displayed in red, while the sentence of a different speaker is displayed in blue. In this way,  
8 several sentences by different speakers can be displayed in one or two lines without causing  
9 any confusion about who is speaking.

10 Although the separate display means is mainly intended for the textual information of closed  
11 caption text, translation and original text, it can also be used to display other textual and video  
12 information. For instance, the broadcasting station may display the future program schedule  
13 following the current program. From time to time, broadcasting stations display textual  
14 information at the bottom of the monitor while broadcasting a regular program. Sometimes,  
15 urgent information is displayed at the bottom of the monitor and this kind of information can be  
16 effectively displayed on the separately display means. Furthermore, when a television station  
17 broadcasts a sports game, the television station can use the separate display unit to display  
18 scores and other information about the game. Sometimes, information on a game can be better  
19 displayed using images. For instance, when a station broadcasts a baseball game, the  
20 information on runners can be effectively displayed using an image, as shown in Fig. 10. This  
21 image can be transmitted to the separate display means as bitmap. These kinds of auxiliary  
22 textual and visual information can be effectively displayed on the separate display means.

23 Sometimes, a broadcasting station transmits information on the program that it is currently  
24 broadcasting since a viewer, who tunes in during the middle of the program, may not know the  
25 title of the program. In particular, if the program is long, such as a movie, it would be very  
26 helpful if the station could provide information on the program for viewers who tune in during  
27 the middle of the program. Usually, broadcasters transmit information about a program that is

1 currently being broadcast at the end of commercial advertisements. Alternatively, a broadcaster  
2 may display textual information about the program in a corner of the picture from time to time.  
3 With a separate display unit available, broadcasters can display such information on the  
4 program that is currently being broadcast in the separate display unit. For instance, the separate  
5 display means can be used to display the station name, the title of the current program, and the  
6 remaining time of the current program. The broadcasting station may display the program  
7 information on the separate display unit when it is not being used for some other purpose. If  
8 the television receiver has multiple separate display units, this kind of information can be more  
9 effectively displayed. For instance, in Fig. 27 the television receiver has two separate display  
10 units 370, 371. On the upper separate display unit 370, the television receiver displays the  
11 channel number (15), the station name (QZC2), the title of the program (Space Invasion), and  
12 the remaining time of the program (1:15), while the lower separate display unit 371 displays  
13 subtitles of the program. In addition, the current local time (9:23PM) 372 is also displayed.  
14 Furthermore, with digital television broadcasting, data broadcasting is also possible and some  
15 of these data can be displayed in the separate display unit.

16 When a station needs to display such auxiliary textual information, it should be transmitted in  
17 such a way that a television receiver can distinguish them. For example, the television receiver  
18 should be able to determine whether signals for textual information are subtitles or the title of  
19 the program. If textual information is transmitted as closed caption text, the auxiliary  
20 information may be transmitted between some special characters. Fig. 11 shows some  
21 examples of such characters.

22 With the separate display means available, the broadcasting station may choose to display these  
23 kinds of textual information in the separate display means. However, if the separate display  
24 means is already being used, the television receiver needs to display the textual information sent  
25 by the broadcasting station in such a way that the viewer can distinguish among the various  
26 kinds of information. For example, they can be displayed on a different line or displayed using

1 different colors. If the television receiver has multiple separate display units, it can display them  
2 on different display units.

3  
4 Furthermore, with the separate display means available, a viewer can display subtitles in  
5 several languages simultaneously. For instance, the viewer can display subtitles **350** in the  
6 original language on the screen and other subtitles **351** in the viewer's own language on a  
7 different separate display unit, as shown in Fig. 25. If the television receiver has multiple  
8 separate display units, they can be used to display subtitles in several languages on different  
9 separate display units. For instance, a viewer can display subtitles in the original language on  
10 one separate display unit **361** and another subtitle in the viewer's own language on a different  
11 separate display unit **360**, as shown in Fig. 26.

## 12 Embodiment 2

13 When a foreign movie is shown in a cinema, usually the translation is also shown on the  
14 screen. Typically, the translation is directly written onto the film. As with the television  
15 receiver, this translation blocks a substantial portion of the screen, thereby preventing viewers  
16 from watching the full picture. The teaching and idea of the present invention can be also  
17 applied to this case. According to the teaching of the present invention, the movie theater  
18 installs a separate display unit **220** as illustrated in Fig. 12 and displays the textual translation  
19 in the separate display means **220**. As in the case of television receiver, the location of the  
20 separate display means may be anywhere outside of the video display area **221**. In Fig. 10, the  
21 separate display unit **220** is located below the screen **221**. The separate display unit **230** can  
22 also be placed above the screen **231** (Fig. 13). Some languages can be written vertically. In  
23 such cases, the separate display **240** can be positioned vertically to the right of the screen **241**  
24 (Fig. 14). Alternatively, the separate display **250** can be positioned vertically to the left of the  
25 screen **251** (Fig. 15).

1 Since most movies shown in a cinema are recorded on analog films, typically the textual  
2 translation is written directly onto the film. Generally, it is difficult to separate this textual  
3 information from the film. Although one may use OCR (optical character recognition)  
4 techniques to extract the textual information, it is difficult. Moreover, once the subtitle is  
5 written on the film, parts of the picture signals are permanently lost. A possible solution is to  
6 record the textual translation on digital media and then send the digital data to the separate  
7 display unit in synchronization with the movie. Fig. 16 shows an exemplary system  
8 configuration when a separate system **260** is used to store the textual translation and send the  
9 textual information to the separate display unit **261**. There are the analog film projector **262**  
10 that projects videos onto the screen **263** and the digital system **260** which sends the textual  
11 information to the separate display unit **261**. If the playing speeds of the analog film projector  
12 **262** and the digital system **260** are exactly the same, then the speech in the movie and the  
13 textual translation will match exactly. However, if the playing speed of any one of the two  
14 players varies, it will result in a mismatch between the speech and text translation. In order to  
15 address this problem, synchronization means is also required. Fig. 17 shows a block-diagram  
16 of such synchronization means.

17 One possible way to implement synchronization means is to put a special marker on the analog  
18 film. Typically, over 30 frames are played per second in most movies. Even if one of the  
19 frames has a special marker **280** as shown in Fig. 18, the human eye cannot usually notice it.  
20 For example, in Fig. 18, the marker has a rectangular shape with a mono color and is located in  
21 the lower right corner. One can choose the shape and color of the marker **280** so that it will be  
22 easily detectable later. Thus, one can place a number of such special markers throughout the  
23 film and use the markers for synchronization. In order to detect the marker, each frame is  
24 digitized using a picture capture and a processor checks the lower right corner. The marker can  
25 be easily detected if the marker has a special shape and color. It is very unlikely that movies  
26 would include frames that accidentally have the same marker. It is also possible to put other  
27 markers **290** to films as shown in Fig. 19. Another possible way to implement synchronization  
28 means is to use a film counter that counts film frames. In this case, the digital system **260** of

Fig. 16 reads the film counter and sends the textual information to the separate display unit **261** in a synchronous manner.

As technology advances, it is expected that in the future, movies will be stored and distributed in digital formats. In such digital cinema, a new type of projector **300**, such as an LCD (liquid crystal display) projector, can be used. In this case, the data processing system **305** takes both video data **301** and text data **302**, and produces video signals for the LCD projector. The video signals are transmitted to the LCD projector through a cable **306**. In particular, the data processing system **305** arranges video and text data such that the video data is displayed on the video part **303** of the screen and the text data on the text part **304** of the screen. In this case, the movie theater need not install a separate display unit. It needs to make the screen larger so that it can display video and textual information together. Fig. 21 illustrates various examples of such screens.

### Embodiment 3

Recently, DVD has become a popular medium for recording videos. DVD has many advantages over videocassettes, such as VHS. One of the advantages of DVD is that a user can choose whether to display subtitles or not. Furthermore, the subtitles are provided in several languages. Thus, a user can choose the language they want to display. Typically, a DVD player decodes videos and subtitle images, and then combines them to form a new video signal. Then, the DVD player sends it to a display apparatus such as a television receiver. Since the present invention requires videos and text images to be separated for the text to be displayed in the separate display unit, the DVD player should combine the two signals in such a way that they can be separated later.

Fig. 22 shows a typical connection scheme between a DVD player and a television receiver. There are connections for video and audio signals. Since DVD provides multichannel audio, several cables are required for audio signals. Thus, most DVD players have digital out for

1 multichannel audio. In order to display text information in the separate display unit, the DVD  
2 player may use a different video connection, as shown in Fig. 23, to send subtitle images to a  
3 television receiver. Alternatively, one can use a video cable that can carry multiple video  
4 signals.

5 Typically, the text area, which is a part of the subtitle image, can be easily extracted. Fig. 24  
6 shows an example of the subtitle image. The DVD player can send subtitle images to the  
7 television receiver and the television receiver extracts the area that contains the text and displays  
8 the text on the separate display means. Alternatively, the DVD player may extract the area that  
9 contains the text and send the data for the text area to the television receiver. In either case, the  
10 data can be sent to the television receiver as either bitmap or video signals. Regardless of  
11 whether the data are be sent to the television receiver as bitmap or video signals, there should  
12 be a certain protocol so that the text can be displayed properly on the separate display means.

13 Another possible solution is to mix the textual information with video signals in such a way that  
14 they can be separated later. For example, one can first apply an optical character recognition  
15 (OCR) technique to subtitle images to extract textual information. Once the textual information  
16 is recognized, it can easily be mixed with the video signals in such a way that they can be  
17 separated later. One such technique is closed caption text. Thus, after the textual information is  
18 recognized, the DVD player mixes the textual information with the video signals in the format  
19 of closed caption text. Then the television receiver can display the textual information, which is  
20 transmitted as closed caption text, on the separate display unit. Although this solution does not  
21 need an additional video cable as in the previous case, the DVD player needs to have an OCR  
22 algorithm. Fortunately, many producers are producing DVDs that already contain closed  
23 caption text in addition to subtitle images. In other words, such DVDs have both subtitle  
24 images and closed caption text for textual information. In this case, it is easy for a DVD player  
25 to send textual information to a television receiver, so that the television receiver can easily  
26 separate the textual information and display it on the separate display unit.

# 1 Embodiment 4

2 The broadcasting station utilizes the separate display means to display various kinds of  
3 information about programs. First of all, the broadcasting station transmits information on the  
4 current program for those viewers who tune in during the middle of the program. With a  
5 separate display unit available, the broadcaster can display information on the program that is  
6 currently broadcast in the separate display unit. For instance, the broadcasting station can  
7 display the station name, the title of the current program, and the remaining time of the current  
8 program. These kinds of auxiliary information can be transmitted whenever the bandwidth is  
9 available. The broadcasting station may display the program information on the separate display  
10 unit when it is not being used for other purpose. However, if the separate display unit is  
11 already being used and the broadcasting station tries to display other textual information, then  
12 the television receiver needs to display the various kinds of textual information sent by the  
13 broadcasting station in such a way that the viewer can distinguish among them. For example,  
14 they can be displayed on different lines or by using different colors. Furthermore, when a  
15 station needs to display these kinds of auxiliary textual information, they should be transmitted  
16 in such a way that a television receiver can distinguish them from subtitles. In other words, the  
17 television receiver should be able to determine whether signals for textual information are  
18 subtitles or auxiliary information. If textual information is transmitted as closed caption text, the  
19 auxiliary information may be transmitted between some special characters during the time when  
20 subtitles in closed caption text are not being transmitted. Fig. 11 shows some examples of such  
21 special characters.

22 If the television receiver has multiple separate display units, these kinds of information can be  
23 more effectively displayed. For instance, in Fig. 27 the television receiver has two separate  
24 display units **370**, **371**. On the upper separate display unit **370**, the television receiver  
25 displays the channel number (15), the station name (QZC2), the title of the program (Space  
26 Invasion), and the remaining time of the program (1:15), while the lower separate display unit  
27 **371** display subtitle of the program. In addition, the current local time (9:23PM) **372** is also

1 displayed. Furthermore, with digital television broadcasting, data broadcasting is also possible  
2 and some of these data can be displayed in the separate display unit.

3 The television receiver may store some of these kinds of auxiliary information and display them  
4 later. For instance, the television receiver can store the station names of channels and display  
5 them whenever the viewer changes channels. If the television receiver has already the  
6 information on the current program of a channel, such as the title and remaining time of the  
7 program, the television receiver can display them whenever the viewer tunes into the channel.